

CLAIMS:

1. A cellular thermoplastic polymer foam having an average cell diameter of greater than 4 mm.
2. A cellular thermoplastic polymer foam having an average cell diameter of greater than 2 mm wherein greater than 50 percent of the cells have been opened by mechanical means.
3. A cellular thermoplastic polymer foam according to Claim 2 wherein the average cell diameter is greater than 3 mm.
4. A cellular thermoplastic polymer foam according to Claim 3 wherein the average cell diameter is greater than 4mm.
5. A cellular thermoplastic polymer foam having an airflow resistivity of less than 800,000 Rayls/m and an average cell diameter of greater than 2 mm, wherein greater than 50 percent of the cells have been opened by mechanical means.
6. A cellular thermoplastic polymer foam according to Claim 5 wherein the average cell diameter is greater than 3 mm.
7. A cellular thermoplastic polymer foam according to Claim 6 wherein the average cell diameter is greater than 4 mm.
8. A cellular thermoplastic polymer foam according to Claim 5 having an airflow resistivity of less than 400,000 Rayls/m.
9. A cellular thermoplastic polymer foam according to Claim 6 having an airflow resistivity of less than 400,000 Rayls/m.
10. A cellular thermoplastic polymer foam according to Claim 7 having an airflow resistivity of less than 400,000 Rayls/m.
11. A cellular thermoplastic polymer foam according to Claim 5 having an airflow resistivity of less than 100,000 Rayls/m.
12. A cellular thermoplastic polymer foam according to Claim 6 having an airflow resistivity of less than 100,000 Rayls/m.
13. A cellular thermoplastic polymer foam according to Claim 7 having an airflow resistivity of less than 100,000 Rayls/m.

14. A cellular thermoplastic polymer foam according to Claim 5 having an airflow resistivity of less than 50,000 Rayls/m.

15. A cellular thermoplastic polymer foam according to Claim 6 having an airflow resistivity of less than 50,000 Rayls/m.

5 16. A cellular thermoplastic polymer foam according to Claim 7 having an airflow resistivity of less than 50,000 Rayls/m.

*Sub* 17. A process for preparing a cellular thermoplastic polymer foam structure comprising the steps of:

10 a) providing a first cellular thermoplastic polymer foam structure with an average cell diameter of from 2 mm to 15 mm, wherein at least some portion of the cells thereof are closed-cells; and

b) applying a means for opening closed-cells in a cellular thermoplastic polymer foam to at least some portion of at least one surface of said first thermoplastic polymer foam structure, such application being sufficient to result in a cellular thermoplastic polymer foam structure having an average cell diameter of from 2 mm to 15 mm wherein greater than 50 percent of the cells have been opened by the application of the means for opening closed-cells in a cellular thermoplastic polymer foam.

15 18. A process according to Claim 17 wherein the first cellular thermoplastic polymer foam structure is substantially closed-celled.

20 19. A process according to Claim 17 wherein the first cellular thermoplastic polymer foam structure is substantially open-celled.

20. A process according to Claim 17 wherein the first cellular thermoplastic polymer foam structure has an average cell diameter of from 2 mm to 10 mm.

25 21. A process according to Claim 20 wherein the first cellular thermoplastic polymer foam structure has an average cell diameter of from 3 mm to 10 mm.

22. A process according to Claim 21 wherein the first cellular thermoplastic polymer foam structure has an average cell diameter of from 4 mm to 8 mm.

23. A process according to Claim 17 wherein the first cellular thermoplastic polymer foam structure is prepared from an olefinic polymer.

30 24. A process according to Claim 23 wherein the olefinic polymer is selected from ethylenic polymers, copolymers, or blends thereof.

25. A process according to Claim 23 wherein the olefinic polymer is polypropylene.

26. A process according to Claim 23 wherein the olefinic polymer is a blend of polypropylene and an ethylene-styrene interpolymmer.

27. A process according to Claim 24 wherein the ethylenic polymer is a low density polyethylene.

28. A process according to Claim 24 wherein the ethylenic polymer is a blend of a low density polyethylene and an ethylene-styrene interpolymmer.

29. A process according to Claim 28 wherein the ethylene-styrene interpolymmer has a styrene content of at least 60 percent by weight.

30. A process according to Claim 28 wherein the blend of a low density polyethylene and an ethylene-styrene interpolymmer contains at least 50 percent by weight of low density polyethylene.

31. A process according to Claim 17 wherein greater than 70 percent of the cells of the cellular thermoplastic polymer foam structure have been opened by the application of the means for opening closed-cells in a cellular thermoplastic polymer foam.

32. A process according to Claim 17 wherein greater than 90 percent of the cells of the cellular thermoplastic polymer foam structure have been opened by the application of the means for opening closed-cells in a cellular thermoplastic polymer foam.

33. A process according to Claim 17 wherein the cellular thermoplastic polymer foam structure has an airflow resistivity of less than 800,000 Rayls/m.

34. A process according to Claim 33 wherein the cellular thermoplastic polymer foam structure has an airflow resistivity of less than 400,000 Rayls/m.

35. A process according to Claim 34 wherein the cellular thermoplastic polymer foam structure has an airflow resistivity of less than 100,000 Rayls /m.

36. A process according to Claim 35 wherein the cellular thermoplastic polymer foam structure has an airflow resistivity of less than 50,000 Rayls/m.

37. A process according to Claim 17 wherein said means for opening is selected from perforation, slicing, compression, or combinations thereof.

38. A process according to Claim 37 wherein said means for opening includes slicing.

39. A process according to Claim 37 wherein said means for opening includes compression.

40. A process according to Claim 39 wherein said means for opening is perforation followed by compression.

5 41. A process according to Claim 37 wherein said means for opening includes perforation.

42. A process according to Claim 41 wherein the perforation comprises one or more square patterns.

10 43. A process according to Claim 41 wherein the perforation is performed in a one or more triangular patterns.

44. A process according to Claim 41 wherein the means for opening is a compression followed by perforation.

15 45. A process according to Claim 41 wherein the perforation is performed in a manner which results in the perforations being spaced one from another at distances which are no greater than two times the average diameter of the cells within the first cellular thermoplastic polymer foam structure.

20 46. A process according to Claim 45 wherein the perforation is performed in a manner which results in the perforations being spaced one from another at distances which are no greater than 1.5 times the average diameter of the cells within the first cellular thermoplastic polymer foam structure.

47. A process according to Claim 46 wherein the perforation is performed in a manner which results in the perforations being spaced one from another at distances which are approximately equal to the average diameter of the cells within the first cellular thermoplastic polymer foam structure.

25 48. A process according to Claim 46 wherein the perforation is performed in a manner which results in the perforations being spaced one from another at distances which are less than the average diameter of the cells within the first cellular thermoplastic polymer foam structure.

30 49. A process according to Claim 41 wherein the perforation comprises puncturing the first cellular thermoplastic polymer foam structure with one or more pointed, sharp objects.

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50. A process according to Claim 49 wherein the pointed, sharp objects is selected from needles, pins, spikes, or nails.
51. A process according to Claim 48 wherein the perforation comprises puncturing the first cellular thermoplastic polymer foam structure by drilling, laser cutting, high pressure fluid cutting, air guns, or projectiles.
52. A foam according to Claim 1 further comprising a fire retardant.
53. A foam according to Claim 1 wherein the foam has been formed into a profile having a low dynamic stiffness.
54. A foam according to Claim 1 wherein the foam is prepared from an olefinic polymer.
55. A foam according to Claim 54 wherein the olefinic polymer is selected from ethylenic polymers, copolymers, or blends thereof.
56. A foam according to Claim 54 wherein the olefinic polymer is polypropylene.
57. A foam according to Claim 54 wherein the olefinic polymer is a blend of polypropylene and an ethylene-styrene interpolymers.
58. A foam according to Claim 55 wherein the ethylenic polymer is a low density polyethylene.
59. A foam according to Claim 55 wherein the ethylenic polymer is a blend of a low density polyethylene and an ethylene-styrene interpolymers.
60. A foam according to Claim 59 wherein the ethylene-styrene interpolymers has a styrene content of at least 60 percent by weight.
61. A foam according to Claim 59 wherein the blend of a low density polyethylene and an ethylene-styrene interpolymers contains at least 50 percent by weight of low density polyethylene.
62. A foam according to Claim 53 wherein the profile is comprised of a core of cellular thermoplastic foam to which narrow strips of the same or a different cellular thermoplastic polymer foam have been attached alternately on opposite sides of the foam core.
63. A foam according to Claim 62 wherein the distances between the middle point of the narrow strips of cellular thermoplastic polymer foam are at least 250 mm.

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64. A foam according to Claim 63 wherein the distances between the middle points of the narrow strips of cellular thermoplastic foam on the same side of the foam core are from 300 mm to 600 mm.

5 65. A foam according to Claim 53 wherein the profile is comprised of a core of cellular thermoplastic foam to which narrow strips of the same or a different cellular thermoplastic foam structure have been attached on the same side and at opposite ends of the foam core.

66. A foam according to Claim 65 wherein the distances between the middle points of the narrow strips are at least 350 mm.

10 67. A foam according to Claim 66 wherein the distances between the middle points of the narrow strips are between 450 mm to 600 mm.

68. A foam according to Claim 2 wherein the foam has been formed into a profile having a low dynamic stiffness.

15 69. A foam according to Claim 68 wherein profile is comprised of a core of cellular thermoplastic foam to which narrow strips of the same or a different cellular thermoplastic polymer foam have been attached alternately on opposite sides of the foam core.

70. A foam according to Claim 69 wherein the distances between the middle point of the narrow strips of cellular thermoplastic polymer foam are at least 250 mm.

20 71. A foam according to Claim 70 wherein the distances between the middle points of the narrow strips of cellular thermoplastic foam on the same side of the foam core are from 300 mm to 600 mm.

25 72. A foam according to Claim 68 wherein the profile is comprised of a core of cellular thermoplastic foam to which narrow strips of the same or a different cellular thermoplastic foam structure have been attached on the same side and at opposite ends of the foam core.

73. A foam according to Claim 72 wherein the distances between the middle points of the narrow strips are at least 350 mm.

30 74. A foam according to Claim 73 wherein the distances between the middle points of the narrow strips are between 450 mm to 600 mm.

75. A foam according to any one of Claims 1 and 52 to 61, wherein the foam is obtainable by extruding a foamable gel, comprising the thermoplastic polymer having a blowing agent incorporated therein, through a die into a lower pressure zone which is at atmospheric or subatmospheric pressure.

52/76. A foam according to any one of Claims 1 and 52 to 61, wherein the foam is made by extrusion, the cells are elongated, and the orientation of cell elongation is in the extrusion direction.

77. A foam according to Claim 76 which is closed celled.

78. A foam according to any one of Claims 1 and 52 to 61 in a coalesced strand form.

79. A foam according to any one of Claims 1, 52 to 61, which has a portion of previously closed cells opened by mechanical cell opening.

80. A foam according to any one of Claims 1 and 52 to 61 in the form of non-crosslinked beads.

81. A cellular thermoplastic polymer foam having an average cell diameter greater than 2 mm, wherein greater than 50 percent of the cells have been opened by mechanical means measured according to ASTM D2856, Procedure C.

82. A foam according to any one of Claims 1 and 52 to 61, wherein the polymer has been grafted with a vinyl functional silane or an azido functional silane.

83. A foam according to any one of Claims 1 and 52 to 61, wherein the foam has been crosslinked.